It is claimed:

1. An integrated circuit, the integrated circuit couplable to a semiconductor laser and to a photodetector, the photodetector optically couplable to the semiconductor laser, the semiconductor laser capable of transmitting an optical signal in response to a modulation current, and the photodetector capable of converting the optical signal into a photodetector current, the integrated circuit comprising:

a modulator couplable to the semiconductor laser, the modulator capable of providing the modulation current to the semiconductor laser, the modulation current corresponding to an input data signal; and

an optical midpoint controller couplable to the photodetector and couplable to the semiconductor laser, the optical midpoint controller, in response to the photodetector current, capable of adjusting a forward bias current of the semiconductor laser to generate the optical signal having a substantially predetermined optical midpoint power level.

2. The integrated circuit of claim 1, wherein the modulator is capable of providing a first modulation current level to the semiconductor laser when the input data signal has a first logical state and providing a second modulation current level to the semiconductor laser when the input data signal has a second logical state, the first modulation current level being greater than the second modulation current level; wherein the semiconductor laser is capable of providing the optical signal having a first optical power level in response to the first modulation current level and having a second optical power level in response to the second modulation current level, the first optical power level being greater than the second optical power level; and wherein the photodetector is further capable of generating a first photodetector current level in response to the first optical power level and a second photodetector current level in response to the second optical power level.

3. The integrated circuit of claim 2, wherein the optical midpoint controller is further capable of:

sampling the first photodetector current level to form a plurality of first photodetector current indicators;

sampling the second photodetector current level to form a plurality of second photodetector current indicators;

determining a measured optical midpoint power level as an overall mean of a first arithmetic mean of the plurality of first photodetector current indicators and a second arithmetic mean of the plurality of second photodetector current indicators;

determining a variance between the measured optical midpoint power level and the predetermined optical midpoint power level, and based on the variance, forming an optical midpoint error signal.

4. The integrated circuit of claim 3, wherein the optical midpoint controller is further capable of integrating the optical midpoint error signal with a plurality of previous optical midpoint error signals to form an integrated optical midpoint error signal; and wherein the optical midpoint controller is further capable of adjusting the forward bias current by providing a selected current path for the semiconductor laser, the selected current path corresponding to the integrated extinction ratio error signal.

5. The integrated circuit of claim 2, wherein the optical midpoint controller is capable of sampling the first photodetector current level to form a first photodetector current indicator, sampling the second photodetector current level to form a second photodetector current indicator, determining a measured optical midpoint power level as an arithmetic mean of the first photodetector current indicator and the second photodetector current indicator, determining a variance between the measured optical midpoint power level and the predetermined optical midpoint power level and, based on the variance, forming an optical midpoint error signal.

6. The integrated circuit of claim 5, wherein the optical midpoint controller is capable of sampling the first photodetector current level and the second photodetector current level by sampling corresponding voltage levels.

7. The integrated circuit of claim 5, wherein the optical midpoint controller is enabled to sample the first photodetector current level when the input data signal has a predetermined number of consecutive bits having the first logical state and is enabled to sample the second photodetector current level when the input data signal has a predetermined number of consecutive bits having the second logical state.

8. The integrated circuit of claim 5, wherein the optical midpoint controller is enabled to sample the first photodetector current level when the input data signal has the first logical state for a predetermined period of time and is enabled to sample the second photodetector current level when the input data signal has the second logical state for the predetermined period of time.

9. The integrated circuit of claim 5, wherein the optical midpoint controller is further capable of integrating the optical midpoint error signal with a plurality of previous optical midpoint error signals to form an integrated optical midpoint error signal; and wherein the optical midpoint controller is further capable of adjusting the forward bias current in response to the integrated optical midpoint error signal.

10. The integrated circuit of claim 5, wherein the optical midpoint controller is further capable of integrating the optical midpoint error signal with a plurality of previous optical midpoint error signals to form an integrated optical midpoint error signal; and wherein the optical midpoint controller is further capable of adjusting the forward bias current by providing a selected current path for the semiconductor laser, the selected current path corresponding to the integrated extinction ratio error signal.

11. The integrated circuit of claim 5, wherein the optical midpoint controller is further capable of providing, in response to the optical midpoint error signal, a forward

bias current adjustment signal to a variable current source, and wherein, in response to the forward bias current adjustment signal, the variable current source is capable of adjusting the forward bias current of the semiconductor laser to generate the optical signal having a substantially constant, predetermined optical midpoint power level.

12. The integrated circuit of claim 2, wherein the optical midpoint controller further comprises:

a sampler coupled to the photodetector, the sampler capable of sampling the first photodetector current level to form a plurality of first photodetector current indicators and sampling the second photodetector current level to form a plurality of second photodetector current indicators; and

a forward bias current controller coupled to the sampler and couplable to the semiconductor laser, the forward bias current controller capable of determining a measured optical midpoint power level as an overall arithmetic mean of a first arithmetic mean of the plurality of first photodetector current indicators and a second arithmetic mean of the plurality of second photodetector current indicators, and comparing the measured optical midpoint power level to the predetermined optical midpoint power level to form an optical midpoint error signal.

13. The integrated circuit of claim 2, wherein the optical midpoint controller further comprises:

a sampler coupled to the photodetector, the sampler capable of sampling the first photodetector current level to form a first photodetector current indicator and sampling the second photodetector current level to form a second photodetector current indicator; and

a forward bias current controller coupled to the sampler and couplable to the semiconductor laser, the forward bias current controller capable of determining a measured optical midpoint power level as an arithmetic mean of the first photodetector current indicator and the second photodetector current indicator, and further capable of comparing the measured optical midpoint power level to the predetermined optical midpoint power level to form an optical midpoint error signal.

14. The integrated circuit of claim 13, wherein the sampler further comprises:

an analog-to-digital converter coupled to the photodetector, the analog-to-digital converter capable of sampling the first photodetector current level to form a first photodetector current indicator and sampling the second photodetector current level to form a second photodetector current indicator; and

a timer coupled to the analog-to-digital converter, the timer capable of enabling the analog-to-digital converter to sample the first photodetector current level when the input data signal has a predetermined number of consecutive bits having the first logical state and enabling the analog-to-digital converter to sample the second photodetector current level when the input data signal has a predetermined number of consecutive bits having the second logical state.

15. The integrated circuit of claim 13, wherein the sampler further comprises:

an analog-to-digital converter coupled to the photodetector, the analog-to-digital converter capable of sampling the first photodetector current level to form a first photodetector current indicator and sampling the second photodetector current level to form a second photodetector current indicator; and

a timer coupled to the analog-to-digital converter, the timer capable of enabling the analog-to-digital converter to sample the first photodetector current level when the input data signal has the first logical state for a predetermined period of time and enabling the analog-to-digital converter to sample the second photodetector current level when the input data signal has the second logical state for the predetermined period of time.

16. The integrated circuit of claim 13, wherein the sampler further comprises:

a first register coupled to the analog-to-digital converter, the first register capable of storing the first photodetector current indicator when the input data signal has a first logical state; and

a second register coupled to the analog-to-digital converter, the second register capable of storing the second photodetector current indicator when the input data signal has a second logical state.

17. The integrated circuit of claim 13, wherein the forward bias current controller further comprises:

a midpoint calculator coupled to the sampler, the midpoint calculator capable of determining a measured optical midpoint power level as an arithmetic mean of the first photodetector current indicator and the second photodetector current indicator; and

a midpoint error generator coupled to the midpoint calculator, the midpoint error generator capable of determining a variance between the measured optical midpoint power level and the predetermined optical midpoint power level and, corresponding to the variance, forming the optical midpoint error signal.

18. The integrated circuit of claim 17, wherein the forward bias current controller further comprises:

a midpoint integrator coupled to the midpoint error generator, the midpoint integrator capable of summing the optical midpoint error signal with a plurality of previous optical midpoint error signals to form an integrated optical midpoint error signal; and

a digital-to-analog converter coupled to the midpoint integrator, the digital-to-analog converter capable of adjusting the forward bias current by providing a selected current path for the semiconductor laser, the selected current path corresponding to the integrated optical midpoint error signal.

19. The integrated circuit of claim 2, further comprising:

an extinction ratio controller couplable to the photodetector and coupled to the modulator, the extinction ratio controller, in response to the photodetector current, capable of adjusting the modulation current provided by the modulator to the semiconductor laser to generate the optical signal having substantially a predetermined extinction ratio.

20. The integrated circuit of claim 19, wherein the extinction ratio controller is further capable of:

sampling the first photodetector current level to form a first photodetector current indicator;

sampling the second photodetector current level to form a second photodetector current indicator;

determining a measured extinction ratio as a ratio of the first photodetector current indicator to the second photodetector current indicator;

determining a variance between the measured extinction ratio and the predetermined extinction ratio, and based on the variance, forming an extinction ratio error signal;

integrating the extinction ratio error signal with a plurality of previous extinction ratio error signals to form an integrated extinction ratio error signal; and

adjusting the modulation current by providing a selected current path for the modulator, the selected current path corresponding to the integrated extinction ratio error signal.

21. The integrated circuit of claim 19, wherein the extinction ratio controller is further capable of:

sampling the first photodetector current level to form a plurality of first photodetector current indicators;

sampling the second photodetector current level to form a plurality of second photodetector current indicators;

determining a measured extinction ratio as a ratio of a first arithmetic mean of the plurality of first photodetector current indicators to a second arithmetic mean of the plurality of second photodetector current indicators;

determining a variance between the measured extinction ratio and the predetermined extinction ratio, and based on the variance, forming an extinction ratio error signal;

integrating the extinction ratio error signal with a plurality of previous extinction ratio error signals to form an integrated extinction ratio error signal; and

adjusting the modulation current by providing a selected current path for the modulator, the selected current path corresponding to the integrated extinction ratio error signal.

22. A method of controlling an optical midpoint power level of a semiconductor laser, the method comprising:

(a) modulating the semiconductor laser at a first modulation level when the input data signal has a first logical state and modulating the semiconductor laser at a second modulation level when the input data signal has a second logical state;

(b) transmitting an optical signal having a first optical power level in response to the first modulation level and having a second optical power level in response to the second modulation level, the first optical power level being greater than the second optical power level;

(c) detecting the first optical power level and the second optical power level;

(d) determining a measured optical midpoint power level as an arithmetic mean of the detected first optical power level and the detected second optical power level;

(e) determining an optical midpoint error as a variance between the measured optical midpoint power level and a predetermined optical midpoint power level; and

(f) using the optical midpoint error, adjusting the forward bias current of the semiconductor laser to generate the optical signal having substantially the predetermined optical midpoint power level.

23. The method of claim 22, wherein step (f) further comprises:

integrating the optical midpoint error with a plurality of previous optical midpoint errors to form an integrated optical midpoint error; and

adjusting the forward bias current of the semiconductor laser in response to the integrated optical midpoint error.

24. The method of claim 22, wherein step (f) further comprises:

integrating the optical midpoint error with a plurality of previous optical midpoint errors to form an integrated optical midpoint error; and

adjusting the forward bias current of the semiconductor laser by providing a selected current path for the semiconductor laser, the selected current path corresponding to the integrated optical midpoint error.

25. The method of claim 22, wherein step (c) further comprises:

detecting the first optical power level by sampling a first photodetector current generated by the first optical power level to form a first photodetector current indicator and detecting the second optical power level by sampling a second photodetector current generated by the second optical power level to form a second photodetector current indicator.

26. The method of claim 25, wherein the sampling of the first photodetector current and the second photodetector current is performed by sampling corresponding voltage levels.

27. The method of claim 25, wherein step (d) further comprises:

determining the measured optical midpoint power level as an overall mean of a first arithmetic mean of a plurality of samples of the first photodetector current and a second arithmetic mean of a plurality of samples of the second photodetector current.

28. The method of claim 25, wherein step (d) further comprises:

determining the measured optical midpoint power level as an arithmetic mean of the first photodetector current indicator and the second photodetector current indicator.

29. The method of claim 25, wherein step (c) further comprises:

sampling the first photodetector current level when the input data signal has a predetermined number of consecutive bits having the first logical state and sampling the second photodetector current level when the input data signal has a predetermined number of consecutive bits having the second logical state.

30. The method of claim 25, wherein step (c) further comprises:

sampling the first photodetector current level when the input data signal has the first logical state for a predetermined period of time and sampling the second photodetector current level when the input data signal has the second logical state for the predetermined period of time.

31. The method of claim 22, further comprising:

determining a measured extinction ratio as a ratio of the detected first optical power level to the detected second optical power level;

determining an extinction ratio error as a variance between the measured extinction ratio and a predetermined extinction ratio;

integrating the extinction ratio error with a plurality of previous extinction ratio errors to form an integrated extinction ratio error; and

using the integrated extinction ratio error signal, adjusting the modulation of the semiconductor laser to generate the optical signal having substantially the predetermined extinction ratio.

32. The method of claim 22, further comprising:

determining a measured extinction ratio as a ratio of a first arithmetic mean of a plurality of detected first optical power levels to a second arithmetic mean of a plurality of detected second optical power levels;

determining an extinction ratio error as a variance between the measured extinction ratio and a predetermined extinction ratio;

integrating the extinction ratio error with a plurality of previous extinction ratio errors to form an integrated extinction ratio error; and

using the integrated extinction ratio error signal, adjusting the modulation of the semiconductor laser to generate the optical signal having substantially the predetermined extinction ratio.

33. An apparatus comprising:

a semiconductor laser capable of transmitting an optical signal having a first optical power level in response to a first modulation current level and having a second optical power level in response to a second modulation current level, the first optical power level being greater than the second optical power level;

a modulator coupled to the semiconductor laser, the modulator capable of providing the first modulation current level to the semiconductor laser when the input data signal has a first logical state and providing the second modulation current level to the semiconductor laser when the input data signal has a second logical state, the first modulation current level being greater than the second modulation current level;

a photodetector optically coupled to the semiconductor laser, the photodetector capable of generating a first photodetector current level in response to the first optical power level and a second photodetector current level in response to the second optical power level;

a sampler coupled to the photodetector, the sampler capable of sampling the first photodetector current level to form a first photodetector current indicator and sampling the second photodetector current level to form a second photodetector current indicator;

a forward bias current controller coupled to the sampler and to the semiconductor laser, the forward bias current controller capable of determining a measured optical midpoint power level as an arithmetic mean of the first photodetector current indicator and the second photodetector current indicator; determining a first variance between the measured optical midpoint power level and a predetermined optical midpoint power level and, based on the first variance, forming an optical midpoint error signal; and in response to the optical midpoint error signal, further capable of adjusting the forward bias current of the semiconductor laser to generate the optical signal having substantially the predetermined optical midpoint power level; and

a modulation current controller coupled to the sampler and to the modulator, the modulation current controller capable of determining a measured extinction ratio as a ratio of the first photodetector current indicator to the second photodetector current indicator; determining a second variance between the measured

extinction ratio and a predetermined extinction ratio and, based on the second variance, forming an extinction ratio error signal; and in response to the extinction ratio error signal, further capable of adjusting the modulation current provided by the modulator to the semiconductor laser to generate the optical signal having substantially the predetermined extinction ratio.

34. The apparatus of claim 33, wherein:

the sampler is further capable of sampling the first photodetector current level to form a plurality of first photodetector current indicators and sampling the second photodetector current level to form a plurality of second photodetector current indicators;

the forward bias current controller is further capable of determining the measured optical midpoint power level as an overall arithmetic mean of a first arithmetic mean of the plurality of first photodetector current indicators and a second arithmetic mean of the plurality of second photodetector current indicators; and

the modulation current controller is further capable of determining the measured extinction ratio as a ratio of a first arithmetic mean of the plurality of first photodetector current indicators to a second arithmetic mean of the plurality of second photodetector current indicators.

35. The apparatus of claim 33, wherein:

the forward bias current controller is further capable of integrating the optical midpoint error signal with a plurality of previous optical midpoint error signals to form an integrated optical midpoint error signal, and adjusting the forward bias current by providing a selected current path for the semiconductor laser, the selected current path corresponding to the integrated optical midpoint error signal; and

the modulation current controller is further capable of integrating the extinction ratio error signal with a plurality of previous extinction ratio error signals to form an integrated extinction ratio error signal, and adjusting the modulation current by providing a selected current path for the modulator, the selected current path corresponding to the integrated extinction ratio error signal.

36. The apparatus of claim 33, wherein the sampler further comprises:

a timer capable of enabling the sampling of the first photodetector current level when the input data signal has a predetermined number of consecutive bits having the first logical state and enabling the sampling of the second photodetector current level when the input data signal has a predetermined number of consecutive bits having the second logical state.

37. The apparatus of claim 33, wherein the sampler further comprises:

a timer capable of enabling the sampling of the first photodetector current level when the input data signal has the first logical state for a predetermined period of time and enabling the sampling of the second photodetector current level when the input data signal has the second logical state for the predetermined period of time.